three intermediate; tibiæ with two black rings at base, and the hinder portion obscure fuscous.

The frontal lobe of pronotum is profoundly bilobed, the frontal tubercles of which are well developed, prominently acute, and slightly directed forwards. The angles of the hinder lobe are rounded, where there is also an obscure tubercle and a longitudinal impression on each side. The abdomen is slightly dilated on each side.

Long. 10 millims.; lat. at pronot. ang. 2½ millims.

Eastern Garo hills, 1500 to 2500 feet.

The most nearly allied form is *C. picticeps*, Stål.

Reduvius nigricollis, Dall.

Arilus nigricollis, Dall. Tr. E. S. Lond. (2), i. p. 8, pl. ii. f. 5 (1850).

Var. Posterior lobe of pronotum castaneous. Underside of abdomen with three or four transverse, lateral, shining black striæ.

Long. ♂, 12½ millims.; ♀, 15 millims. (as described by Dallas from type).

The Homopterous portion of the collection calls for little remark. It contained two new species, which I have already described, viz. *Tosena splendida*, Dist. Ent. Mo. Mag. vol. xv. p. 76 (1878), and *Phymatostetha binotata*, Dist. Trans. Ent. Soc. Lond. 1878, p. 322.

XIII.—*On* Loxosoma *and* Triticella, *Genera of Semiparasitic Polyzoa in the British Seas.* By the Rev. A. M. Norman, M.A.

Genus Loxosoma, Keferstein, 1862.

Loxosoma phascolosomatum, C. Vogt.

1861. "*Strephenterus claviger*, tentacular appendages of," Norman, Ann. & Mag. Nat. Hist. ser. 3, vol. vii. pl. ix. figs. 1–3.

1877. *Loxosoma phascolosomatum*, Carl Vogt, Archives de Zoologie Expérimentale, vol. v. 1877, p. 305; translated by Hincks, Quart. Journ. Micr. Sci. n. s. vol. xvii. 1877, p. 353, pl. xxii. figs. 1–12; Barrois, Mémoire sur l'embryologie des Bryozoaires, p. 8, 9.

In 1861, on examining a bottle of animals which had been dredged by me at Bantry Bay in 1858, I found a Gephyrean which was new to me. It was described in the 'Annals' under the name *Strephenterus claviger*.

Attached to the caudal extremity of this Gephyrean were

certain clavate bodies, which were a sore puzzle. At one time I thought they must be parasitical animals; but then they seemed to be inseparable from the body of the Gephyrean; and after much doubt and consultation with my friend Mr. Alder, they were regarded as part and parcel of the animal to which they were attached, and presumed to be analogous to the tail of *Priapulus*. They were figured as carefully as possible from the spirit-preserved specimens, in order that any doubt there might be about them might hereafter be cleared up, and were thus described:—"The extremity is furnished with from twenty to thirty club-shaped tentacular appendages. These tentacular appendages are of peculiar construction. The longest and most fully expanded present the appearance of fig. 2. The club is somewhat spathulate; and about the centre of the upper half is seen a small round aperture, apparently opening into the interior. Below this there are two projecting processes, one of which is larger than the other; and between the bases of these two processes is seen the rudiment of a third. Another state of the tentacles is shown in fig. 3, which is taken from one of the shorter tentacles—shorter because less expanded, or, more probably, less developed. Here there is no sign of the central opening; but the head seems to contain several pear-shaped bodies, one of which has a blackish central spot. On subjecting this tentacle to the compressorium, these pear-shaped bodies escaped, and appeared to be composed entirely of granular matter enclosed in thin sacs."

At this time *Loxosoma* was unknown; but in 1862 Keferstein described that remarkable parasitic genus of Polyzoa, having found the type species on *Capitella*, Blainville (a genus of Annelida), on the Normandy coast. Since that time much attention has been directed to the genus. Last year Carl Vogt described (*l. c.*) a new form; and his paper was translated by Mr. Hincks, and published in the Quart. Journ. Micr. Sci. The moment I saw the plate which illustrates this paper it was obvious that Vogt's *Loxosoma phascolosomatum* was the final solution of my puzzling tentaculiform appendages of 1858; and I at once wrote to Mr. Hincks and told him that he might add this species of *Loxosoma* to the British fauna in his forthcoming work on the Polyzoa. M. Barrois has arrived at the same conclusion. In his admirable and deeply interesting 'Mémoire sur l'embryologie des Bryozoaires' he notices a *Loxosoma* which he had found abundantly at Roskoff, and adds, "c'est peut-être la même que celle qui a été décrite par Norman, comme organe appendiculaire d'un siponcle qu'il nomme *Strephenterus claviger*; on doit certaine-

ment en faire une espèce distincte." Then, in a note, he adds, "Depuis que ces lignes ont été écrites, j'ai reçu sur cette espèce un nouveau travail, que M. Vogt a eu l'obligeance de m'envoyer; il la décrit sous le nom de *L. phascolosomatum*; j'ai supprimé le nom qui je lui avais déjà donné pour adopter ce dernier"*.

My object in writing this is to fully and finally rectify the mistake into which I had fallen. In 1861 *Loxosoma* had never been heard of, nor was any genus known at all like it; for the structure of *Pedicellina* is in many important points widely different. The peculiar position which these clavate bodies occupied, confined as they were to the caudal extremity of the Gephyrean, and the fact that they were so firmly attached to the host as to seem part of it, mainly conduced to the error. On this last point I may quote from Hincks's abbreviated translation of Vogt:—"As the *Loxosomas* are very firmly attached to the epidermis of the worm, it is almost impossible to remove them unmutilated. To observe them *in situ*, the extremity of the tail bearing the tuft of Polyzoa must be cut off with a pair of scissors and placed entire under the compressor." Vogt's drawings were made under the most favourable circumstances. "The author has made his observations almost exclusively on living animals by means of transmitted light. Patience and abundance of material have been the conditions that have secured his results. All his figures have been taken with the camera from living animals, and finished as far as possible with the animal before him." With these advantageous circumstances contrast the fact that I had only before me specimens which had been three years in a preservative medium, and consequently not only contracted and devoid of that motion absolutely essential to recognize parts in a hitherto unknown microscopic animal, but also that chemical changes had taken place in some of the organs. Let it also be borne in mind that a group of the animals is so small that Vogt says of it, "it forms a tuft hardly visible to the naked eye," and, further, let it be noticed that Vogt's drawings are more than double the scale of mine, and then let my figures 2 and 3 be compared with his, and the correspondence is certainly striking. His figure 2 and my figure 2 might have been drawn from the same specimen; not only the

* It is only since Vogt described *Loxosoma phascolosomatum* that it has been possible to identify the species which I met with; but Leuckart (Archiv für Naturgesch. xx. 1863, ii. Bd.), immediately after Keferstein had described the genus, pointed out that it seemed to have been previously met with by myself; and Nitsche (Beiträge zur Kenntniss der Bryozoen, iii. Heft, 1876, p. 140) also calls attention to my figures as the first representations of this semiparasitic Polyzoon.

animal itself, but the exact proportionate size of the two unequally developed buds show the closest correspondence.

There is nothing to alter in, though much, of course, might be added to, the description I gave of these animals, and which I have quoted above, except to substitute the word *Loxosomæ* for "tentacular appendages." In the description of the plate the following corrections will make the figures intelligible :—

Fig. 1. *Phascolosoma Harveii*, Forbes*, slightly enlarged, with a tuft of *Loxosoma phascolosomatum*, Vogt, *in situ* at the posterior extremity.

Fig. 2. A fully developed *Loxosoma*. *a*, the "opening into the interior." Around this in the figure will be seen converging lines, which, under the condition in which the animal was when examined by me, appeared to be only rugæ of contraction; but these lines, it is now evident, represent the retracted lophophore. *b* and *c* "supplemental processes," as I called them, are two buds in different degrees of development. In the state in which they were examined by me no trace of internal structure could be satisfactorily made out, so as to lead to the slightest suspicion as to their real nature. Vogt says, "there are never more than two buds†, and they are always unequally developed."

Fig. 3. This figure, I now take it, was drawn from a male (as figure 2 was from a female) specimen. Compared with figures 3 and 4 of Vogt, it seems tolerably clear that *f* represents the anal aperture, that *d* and *e* are what Vogt calls the testicles, while below these is seen the reniform space which Vogt considers to be occupied by the stomach and hepatic cells.

Now that the attention of our marine zoologists is called to the subject, it is probable that before long this *Loxosoma* will be rediscovered; and, no doubt, several other species of these semiparasitic Polyzoa will be found in our seas. They should be especially looked for on the Annelida, also on Hydrozoa, Sponges, &c.

It may perhaps be useful if I add here a list of species already discovered as far as known to me.

* *Syrinx Harveii*, Forbes,=*Sipunculus obscurus*, Quat.,=*Phascolosoma margaritaceum*, Keferstein (nec M. Sars),=*Phascolosoma luteum*, Theel,=*Phascolosoma Harveii*, K. & D. This is the synonymy of the species as given by Koren and Danielssen in their 'Fauna Littoralis Norvegiæ,' 3die Hefte, 1877, pp. 136 and 164; and, having examined the several authors' works, I believe it to be correct, except that I should put ? before the *Sipunculus obscurus* of Quatrefages.

† Other known species have many buds developing at the same time.

1. *Loxosoma singulare*, Keferstein.

Loxosoma singulare, Keferstein, Zeitschrift f. wiss. Zool. xii. 1862, p. 13; Claparède, Beob. über Anat. und Entw. wirbelloser Thiere an der Küste von Normandie, 1863, p. 135, pl. ii. figs. 6–10; Barrois, Mém. sur l'Embryologie des Bryozoaires, 1877, p. 10, pl. xvi. figs. 7–14.

2. *Loxosoma neapolitanum*, Kowalewsky.

Loxosoma neapolitanum, Kowalewsky, Mém. de l'Académie Imp. des Sci. de St. Pétersbourg, sér. 7, vol. x. 1866, (separate copy) p. 3, plate.

3. *Loxosoma Kefersteinii*, Claparède.

Loxosoma Kefersteinii, Claparède, Annal. d. Scien. Natur. sér. 5, vol. vii. 1867, p. 28, pl. vi., translated Ann. & Mag. Nat. Hist. 1868, vol. i. p. 311; Claparède, Zeitschr. f. wiss. Zool. xxi. 1870, p. 34, pl. x. fig. 4; Nitsche, Zeitschr. f. wiss. Zool. xxv. 1875, p. 451; Nitsche, Beitr. zur Kenntniss der Bryozoen, iii. Heft, 1876, p. 139, pl. xxv. figs. 4-20, pl. xxvi. figs. 7–13.

4. *Loxosoma cochlear*, Schmidt.

Loxosoma cochlear, Schmidt, Archiv f. mikr. Anat. xii. 1875, fasc. 1; and Bemerkungen zu den Arbeiten über *Loxosoma*, 1878, (separate copy) p. 68.

5. *Loxosoma alata*, Barrois.

Loxosoma singulare, Schmidt, Archiv f. mikr. Anat. xii. 1875, fasc. 1 (nec Keferstein),=*Loxosoma alata*, Barrois, Mém. sur l'embryologie des Bryozoaires, 1877, p. 7,=*Loxosoma pes*, Schmidt, Bemerkungen zu den Arbeiten über *Loxosoma*, 1878, Zeitschr. f. wiss. Zool. xxxi. p. 69.

6. *Loxosoma raia*, Schmidt.

Loxosoma raia, Schmidt, Archiv f. mikr. Anat. xii. 1875, fasc. 1, and Bemerk. z. d. Arbeiten über *Loxosoma*, 1878, *l. c.* p. 71. Barrois considers this synonymous with *L. neapolitanum*.

7. *Loxosoma tethyæ*, Salensky.

Loxosoma tethyæ, Salensky, Annales des Sci. Nat. vol. v. 1877, p. 36; Schmidt, Bemerk. z. d. Arbeiten über *Loxosoma*, 1878, *l. c.* p. 71.

8. *Loxosoma crassicauda*, Salensky.

Loxosoma crassicauda, Salensky, Annal. des Sci. Nat. sér. 6, vol. v. p. 71.

9. *Loxosoma phascolosomatum*, Vogt.

Loxosoma phascolosomatum, Vogt, as above.

What is perhaps another genus of the same family has been described by Van Beneden and Hesse ('Recherches sur les Bdellodes ou Hirudinées et les Trématodes marins,' 1863, p. 82, pl. viii. figs. 12–20), under the name *Cyclatella anne-*

lidicola. It is a parasite on the tail of an Annelid belonging to the genus *Clymene*.

It may be expected that some of the above nine forms will ultimately be found to be states of other species. Thus Vogt would unite 1, 4, and 6; whereas Barrois considers 2 and 4 to be the same species.

Genus Triticella, Dalyell, 1848.

Triticella flava, Dalyell.

1848. *Triticella flava*, Dalyell, Rare and Remarkable Animals of Scotland, ii. p. 66, pl. xix. fig. 1, and pl. xxxvi. fig. 1.
1873. *Triticella flava*, G. O. Sars, Christ. Vidensk.-Selsk. Förhand. 1873, p. 398.
1873. *Triticella Korenii*, G. O. Sars, *l. c.* p. 397, pl. ix. figs. 1-9.

Thirty years ago Dalyell described the above genus, of which he gave rough figures and a brief description. It has since remained entirely unnoticed in Great Britain, not being so much as inserted in lists of our fauna. In 1873, however, Prof. G. O. Sars described two species which he had discovered in the Norwegian fiords, one of which, *Triticella Bæckii*, G. O. Sars, was living on the carapace and legs of the crab *Geryon tridens*, while the other, *Triticella Korenii*, G. O. Sars, had made the carapace of *Calocaris Macandrewi* its home.

In the summer of 1877 I had the pleasure of rediscovering *Triticella flava* in Scotland. When shore-hunting in Kerrera Sound, a little to the south of Oban, I procured a specimen of the now well-known Cirriped parasite *Sacculina carcini*, attached, as usual, to the tail (pleon) of the common shore-crab (*Carcinus mœnas*); the posterior part of the *Sacculina* was subsequently found to be occupied by a colony of the long-lost *Triticella flava*—a parasite of a parasite. But Dalyell supposed that he had found his species parasitic on an Ascidian. We turn to his work; and, behold, what he had taken to be an Ascidian, and figured plate xxxvi. fig. 1, is manifestly no Ascidian at all, but a veritable *Sacculina carcini*! At the time when Dalyell wrote, *Sacculina* had only just been described by Vaughan Thompson; and it is probable that our author was unacquainted with Thompson's paper. Now that the secret is out, and when a search is made in the right place, *Triticella* will probably be often met with.

Those who want to know what this genus is must consult Sars's capital paper, where will be found a detailed description illustrated by his usual admirable drawings. I extract here his Latin abbreviated characters:—

"Ordo CHILOSTOMATA.

Subordo Cellularina.

Familia **Triticellidæ.**

Gen. Triticella, Dalyell.

"Zoœcia simplicia, pedicellata, de crustâ continuâ vel stolone repente surgentia, cute tenui et pellucidâ corneâ (non calcareâ) tecta, lateraliter compressa, facie alterâ (ventrali) latâ in totâ fere longitudine planâ, vel leviter excavatâ, limbo elevato tenui et acuto circumcinctâ, aream aperturæ lateralem distinctam elongato-ellipticam præbente, alterâ (dorsali) fastigiatâ vel medio subcarinatâ fasciâ tenui valde chitinosâ (frenaculo) in semicirculum oblique antice curvatâ firmatâ. Pedicellum subrigidum, rectum, tenuissimum, zoœcio articulatione mobili conjunctum. Apertura zoœcii terminalis sine operculo; vagina tentacularis annulo setarum instructa."

1. *Triticella Bœckii*, G. O. Sars.

"Zoœcia pallide cornea in fasciculos densos aggregata de crustâ continuâ surgentia, pedicellis longissimis zoœciis triplo—quadruplo longioribus instructa, a latere visao blique ovalia extremitate posteriore sat incurvatâ, margine dorsali subsigmoideo ante medium subito valde arcuato, frenaculo chitinoso distinctissimo ab extremitate posteriore sat remoto. Animalcula tentaculis 20 instructa. Longitudo zoœciorum pedicello excepto, 0·75 m. m., latitudo 0·25 m. m.

"Habitat in sinu Christianiensi, prof. 10–20 orgyiarum, carapaci et pedibus *Geryonis tridentis* affixa."

2. *Triticella Korenii*, G. O. Sars.

"Zoœcia subhyalina sparsa de stolone distincto tenui repente surgentia, pedicellis brevioribus zoœciis vix longioribus instructa, a latere visa elongato-ovata extremitate posteriore parum incurvatâ, margine dorsali in totâ fere longitudine æqualiter arcuato, frenaculo chitinoso tenuissimo extremitati posteriori approximato. Animalcula tentaculis 18 instructa. Longitudo zoœciorum, pedicello excepto, 0·90 m. m., latitudo 0·25 m. m.

"Habitat ad oras Norvegiæ occidentalis circa Bergen, prof. 100–300 orgyiarum, nec non ad Bahusiam, carapaci *Calocaris Macandrewi* affixa."

3. *Triticella flava*, Dalyell.

"Zoœcia flava a latere visa breviter ovata, margine dorsali valde arcuato, pedicello brevissimo zoœcio ipso multo breviore. Animalcula tentaculis 20 instructa.

"Habitat ad oras Scotiæ testæ Ascidiarum affixa."

The diagnosis given above of *T. flava*, however, as drawn up by Sars from Dalyell's figure and description, by no means correctly represents the species found by me at Oban, and which, I cannot doubt, is that indicated by Dalyell, more especially as both were found affecting *Sacculina carcini*. It appears to me that Sars has laid too much stress on the comparative length of the pedicel as constituting a specific character. It will be seen that whereas in *T. Bœckii* the pedicel is three or four times as long as the body of the animal, in *T. Korenii* it is said to be about equal in length, while in *T. flava* it is "much shorter than" the zoœcium. Now I find very wide difference in the length of the pedicel in the animals constituting the group which I found at Oban: in some full-grown specimens the pedicel is shorter than the zoœcium; in others it is slightly longer; in others, again, it is two or three times as long. Specific characters, therefore, derived from the length of the pedicel seem in a very great measure to break down. The zoœcia closely correspond with those figured by Sars of *T. Korenii*: the general form is the same; the position of the frenaculum agrees; and there is the same angle at the lower extremity of the ventral concave and more membranous area. Having only found my specimens after they had been preserved in spirits, and the lophophores being in every instance strongly retracted, I am unable to speak with accuracy as to the number of the tentacles, which Sars states are eighteen in *Korenii* and twenty in *flava* and *Bœckii*. The budding young agree with Sars's figures 6, 7, 8, representing this state in *Korenii*; and the animals are connected by a creeping stolon.

Bearing in mind, then, that reliance cannot be placed on minute details in the drawings of Dalyell, I am constrained to come to the conclusion that no valid grounds exist (as far, at any rate, as we as yet know) by which to distinguish the Scotch species, which affects *Sacculina carcini* and is the type of Dalyell's *Triticella flava* from the Norwegian form found by Sars on *Calocaris Macandrewi*, and that the latter must be regarded as a synonym—further, that great latitude must be allowed with respect to the length of the pedicels, which in *T. flava* show great variation, and are often not only as long as described in *Korenii*, but show a great approach to the very long supports of *T. Bœckii*. The higher position of the frenaculum in *T. Bœckii* appears to be its chief character.